

What is claimed is:

1. A system for producing a mist of sub-micron sized fluid droplets, said system comprising:

an atomizer, said atomizer comprising:

a fluid conduit for transporting a pressurized supply of a fluid, said fluid conduit having an inlet and an outlet, wherein said outlet discharges said fluid into a discharge zone; and

a heating element that delivers sufficient thermal energy to said fluid traversing said fluid conduit such that the vapor pressure of said fluid is greater than the pressure in said discharge zone so as to cause said fluid to atomize in said discharge zone thereby producing a mist of sub-micron sized fluid droplets;

a temperature sensor, said temperature sensor in thermal contact with said fluid so as to determine the temperature of said fluid;

a flow control element in fluid communication with said atomizer, said flow control element controlling the volumetric flow rate of said fluid; and

a controller, said controller in electrical communication with said temperature sensor, said flow control element, and said heating element, said controller capable of adjusting said heating element's delivery of thermal energy to said fluid in response to said temperature of said fluid and said volumetric flow rate of said fluid, said controller capable of causing said flow control element to adjust said volumetric flow rate of said fluid.

2. The system according to claim 1 wherein said heating element is a glow plug.

3. The system according to claim 1 wherein said heating element is an external heat source.
4. The system according to claim 1 wherein said fluid conduit is capillary tubing.
5. The system according to claim 4 wherein said fluid conduit comprises two electrical contacts for applying an electrical current so as to use said fluid conduit as a resistive heater.
6. The system according to claim 1 wherein said fluid conduit is a coiled tube.
7. The system according to claim 6 wherein said fluid conduit is used as a resistive heater by applying an electrical current between two points along said fluid conduit.
8. The system according to claim 1 wherein said temperature sensor measures the temperature of said fluid at said outlet.
9. The system according to claim 1 wherein said temperature sensor measures the temperature of said fluid conduit.
10. The system according to claim 1 wherein the electrical resistance of said fluid conduit provides a temperature measurement of said fluid conduit.
11. An engine comprising the system according to claim 1.

12. A vehicle comprising the system according to claim 1.
13. A fuel reformer comprising the system according to claim 1.
14. An air delivery system for a fuel cell system comprising the system according to claim 1.
15. A fluid delivery system, said fluid delivery system comprising:
- a pressurized supply of a fluid, wherein the inlet pressure of said fluid is higher than the discharge pressure of said fluid;
 - a flow control device, said flow control device in fluid communication with said pressurized supply of a fluid, said flow control device actuating in response to a signal so as to open said flow control device thereby permitting said fluid through said flow control device;
 - an atomizer, said atomizer in fluid communication with said flow control device so as to receive said fluid from said flow control device at a desired volumetric flow rate, said atomizer comprising:
 - a fluid conduit for transporting a pressurized supply of a fluid, said fluid conduit having an inlet and an outlet, wherein said outlet discharges said fluid into a discharge zone; and
 - a heating element in thermal contact with said fluid conduit such that said heating element delivers sufficient thermal energy to said fluid traversing said fluid conduit such that the vapor pressure of said fluid is greater than the pressure in said discharge zone so as to cause said

fluid to atomize in said discharge zone thereby producing a mist of sub-micron sized fluid droplets;

a temperature sensor, said temperature sensor in thermal contact with said fluid so as to determine the temperature of said fluid; and

a controller, said controller in electrical communication with said temperature sensor and said heating element, said controller capable of adjusting said heating element's delivery of thermal energy to said fluid in response to said temperature of said fluid and said desired volumetric flow rate.

16. The fluid delivery system according to claim 15 wherein said pressurized supply of a fluid has a pressure higher than the discharge pressure of said fluid conduit.

17. The fluid delivery system according to claim 15 wherein said signal is a pulse width modulated signal.

18. The fluid delivery system according to claim 15 wherein said signal is an analog signal.

19. The fluid delivery system according to claim 15 wherein said flow control device is a fast acting solenoid valve.

20. The fluid delivery system according to claim 15 wherein said flow control device is a servo-valve.

21. The fluid delivery system according to claim 15 wherein said flow control device is an electrically controllable flow restriction

22. The fluid delivery system according to claim 15 wherein said flow control device is placed upstream of the said fluid conduit

23. The fluid delivery system according to claim 15 wherein said flow control device is placed downstream of the said fluid conduit

24. The fluid delivery system according to claim 15 wherein said flow control device is placed within the said fluid conduit

25. An engine comprising the fluid delivery system according to claim 15.

26. A vehicle comprising the fluid delivery system according to claim 15.

27. A fuel reformer comprising the fluid delivery system according to claim 15.

28. A system for treating an exhaust stream by injecting an atomized spray, said system comprising:

an exhaust stream, said exhaust stream comprising at least one chemical species to be treated, said at least one chemical species having an initial concentration;

a flow control device, said flow control device in fluid communication with a pressurized supply of a fluid, said fluid control device actuating in response to

a signal so as to open said flow control device thereby permitting said fluid through said flow control device;

an atomizer, said atomizer in fluid communication with said flow control device so as to receive said fluid from said flow control device at a desired volumetric flow rate, said atomizer comprising:

- a fluid conduit for transporting a pressurized supply of a fluid, said fluid conduit having an inlet and an outlet, wherein said outlet discharges said fluid into said exhaust stream; and

- a heating element in thermal contact with said fluid conduit such that said heating element delivers sufficient thermal energy to said fluid traversing said fluid conduit such that the vapor pressure of said fluid is greater than the pressure in said exhaust stream so as to cause said fluid to atomize in said exhaust stream thereby producing a mist of sub-micron sized fluid droplets;

a temperature sensor, said temperature sensor in thermal contact with said fluid so as to determine the temperature of said fluid;

a controller, said controller in electrical communication with said temperature sensor and said heating element, said controller capable of adjusting said heating element's delivery of thermal energy to said fluid in response to said temperature of said fluid and said desired volumetric flow rate; and

a catalyst, said catalyst chemically interacting with said at least one chemical species so as to treat said at least one chemical species thereby diminishing said initial concentration of said at least one chemical species.

29. A catalytic system for treating at least one chemical species, said catalytic system comprising:

an exhaust stream comprising at least one chemical species, said exhaust stream directed towards a catalyst;

a catalyst for chemically treating said at least one chemical species;

a flow control device, said flow control device in fluid communication with a pressurized supply of a fluid, said flow control device actuating in response to a signal so as to open said flow control device thereby permitting said fluid through said flow control device;

an atomizer, said atomizer in fluid communication with said flow control device so as to receive said fluid from said flow control device at a desired volumetric flow rate, said atomizer comprising:

a fluid conduit for transporting a pressurized supply of a fluid, said fluid conduit having an inlet and an outlet, wherein said outlet discharges said fluid into said exhaust stream; and

a heating element in thermal contact with said fluid conduit such that said heating element delivers sufficient thermal energy to said fluid traversing said fluid conduit such that the vapor pressure of said fluid is greater than the pressure in said exhaust stream so as to cause said fluid to atomize in said exhaust stream thereby producing a mist of sub-micron sized fluid droplets;

a temperature sensor, said temperature sensor in thermal contact with said fluid so as to determine the temperature of said fluid; and

a controller, said controller in electrical communication with said temperature sensor and said heating element, said controller capable of adjusting said

heating element's delivery of thermal energy to said fluid in response to said temperature of said fluid and said desired volumetric flow rate.

30. The catalytic system according to claim 29 additionally comprising at least one non-thermal plasma generator disposed upstream of said catalyst and downstream of said atomizer.

31. The catalytic system according to claim 29 additionally comprising at least one secondary catalyst upstream of said catalyst, said at least one secondary catalyst selected from the group consisting of: low thermal inertia catalysts and electrically heated catalysts, said secondary catalyst capable of producing heat from a chemical reaction when said atomizer introduces said mist of sub-micron sized fluid droplets into said exhaust stream, said heat subsequently acting to raise the temperature of said catalyst downstream.

32. The catalytic system according to claim 29 wherein said fluid is an aqueous urea solution and said catalyst is a SCR catalyst.

33. A system for humidifying an air stream for use in a fuel cell, said system comprising:

an air stream;

a flow control device, said flow control device in fluid communication with a pressurized supply of a fluid, said flow control device actuating in response to a signal so as to open said flow control device thereby permitting said fluid through said flow control device;

an atomizer, said atomizer in fluid communication with said flow control device so as to receive said fluid from said flow control device at a desired volumetric flow rate, said atomizer comprising:

a fluid conduit for transporting a pressurized supply of a fluid, said fluid conduit having an inlet and an outlet, wherein said outlet discharges said fluid into said air stream; and

a heating element in thermal contact with said fluid conduit such that said heating element delivers sufficient thermal energy to said fluid traversing said fluid conduit such that the vapor pressure of said fluid is greater than the pressure in said air stream so as to cause said fluid to atomize in said air stream thereby producing a mist of sub-micron sized fluid droplets;

a temperature sensor, said temperature sensor in thermal contact with said fluid so as to determine the temperature of said fluid;

a controller, said controller in electrical communication with said temperature sensor and said heating element, said controller capable of adjusting said heating element's delivery of thermal energy to said fluid in response to said temperature of said fluid and said desired volumetric flow rate; and

a compressor in fluid communication with said air stream, said compressor pressurizing said air stream so as to generate a pressurized flow of air; and

a fuel cell in fluid communication with said compressor, said fuel cell receiving a pressurized flow of air from said compressor.

34. The system according to claim 33 wherein said atomizer introduces said mist of sub-micron sized fluid droplets upstream of said compressor.

35. The system according to claim 33 wherein said atomizer introduces said mist of sub-micron sized fluid droplets within said compressor.

36. A system for producing a mist of sub-micron sized fluid droplets, said system comprising:

an atomizer, said atomizer comprising:

a fluid conduit for transporting a pressurized supply of a fluid, said fluid conduit having an inlet and an outlet, wherein said outlet discharges said fluid into a discharge zone, said fluid conduit additionally comprising at least two electrical contacts for applying a current across said fluid conduit so as to resistively heat said fluid conduit such that the vapor pressure of said fluid is greater than the pressure in said discharge zone so as to cause said fluid to atomize in said discharge zone thereby producing a mist of sub-micron sized fluid droplets;

a temperature sensor, said temperature sensor in thermal contact with said fluid so as to determine the temperature of said fluid;

a flow control element in fluid communication with said atomizer, said flow control element controlling the volumetric flow rate of said fluid; and

a controller, said controller in electrical communication with said temperature sensor, said flow control element, and said heating element, said controller capable of adjusting said heating element's delivery of thermal energy to said fluid in response to said temperature of said fluid and said volumetric flow rate of said fluid, said controller capable of causing said flow control element to adjust said volumetric flow rate of said fluid.